

**ANATOMY OF  
INVERTEBRATES AND  
ECOLOGY  
(DZOOLO1)  
(MSC ZOOLOGY)**



**ACHARYA NAGARJUNA UNIVERSITY**

**CENTRE FOR DISTANCE EDUCATION**

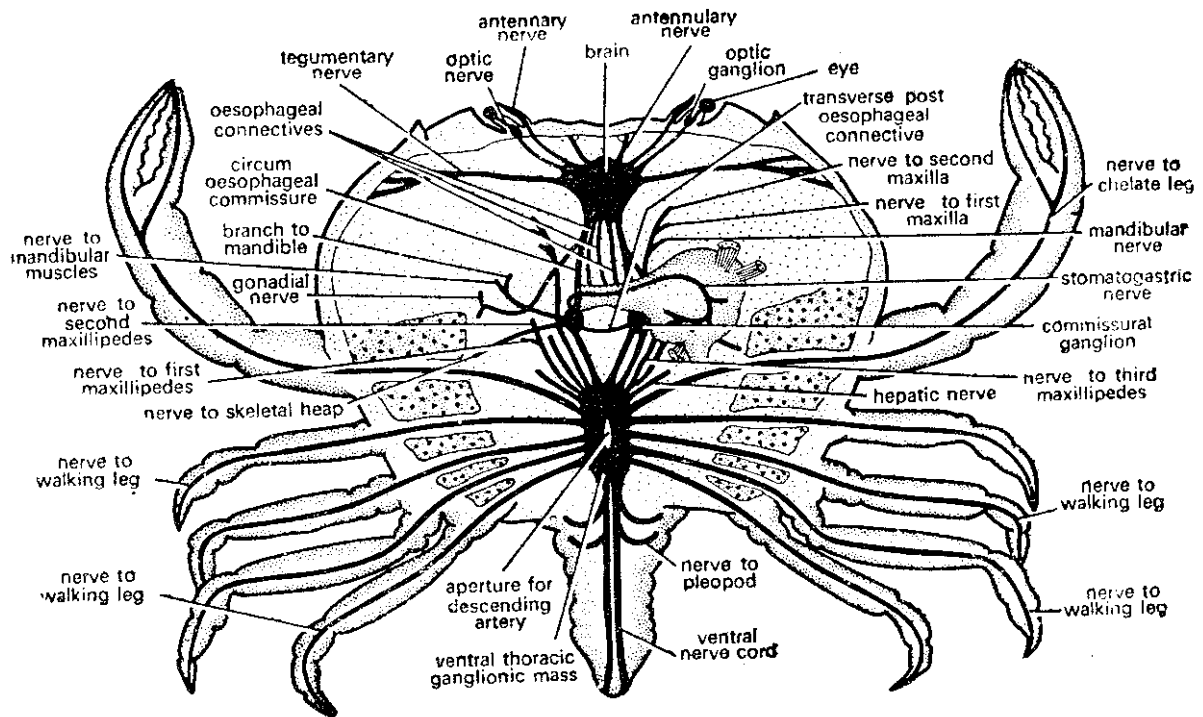
**NAGARJUNA NAGAR,**

**GUNTUR**

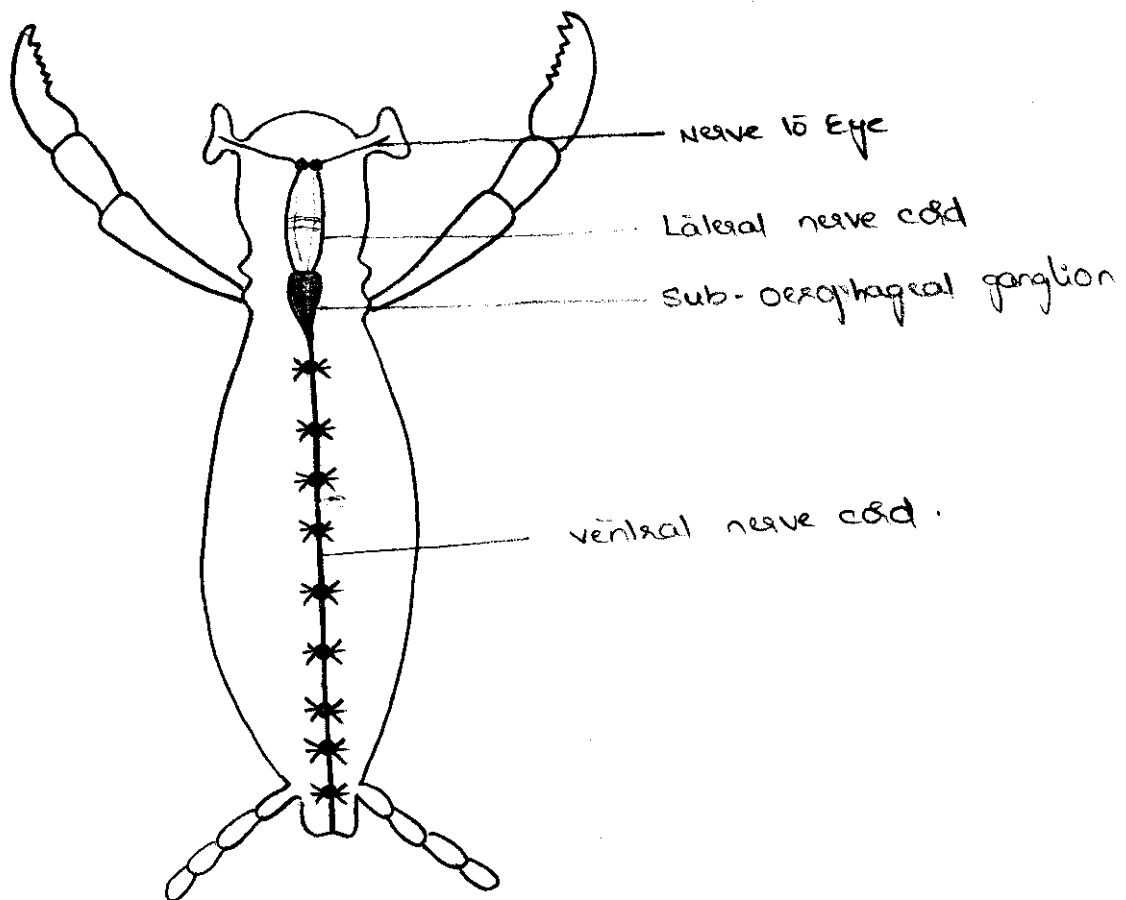
**ANDHRA PRADESH**

## PRACTICAL - I

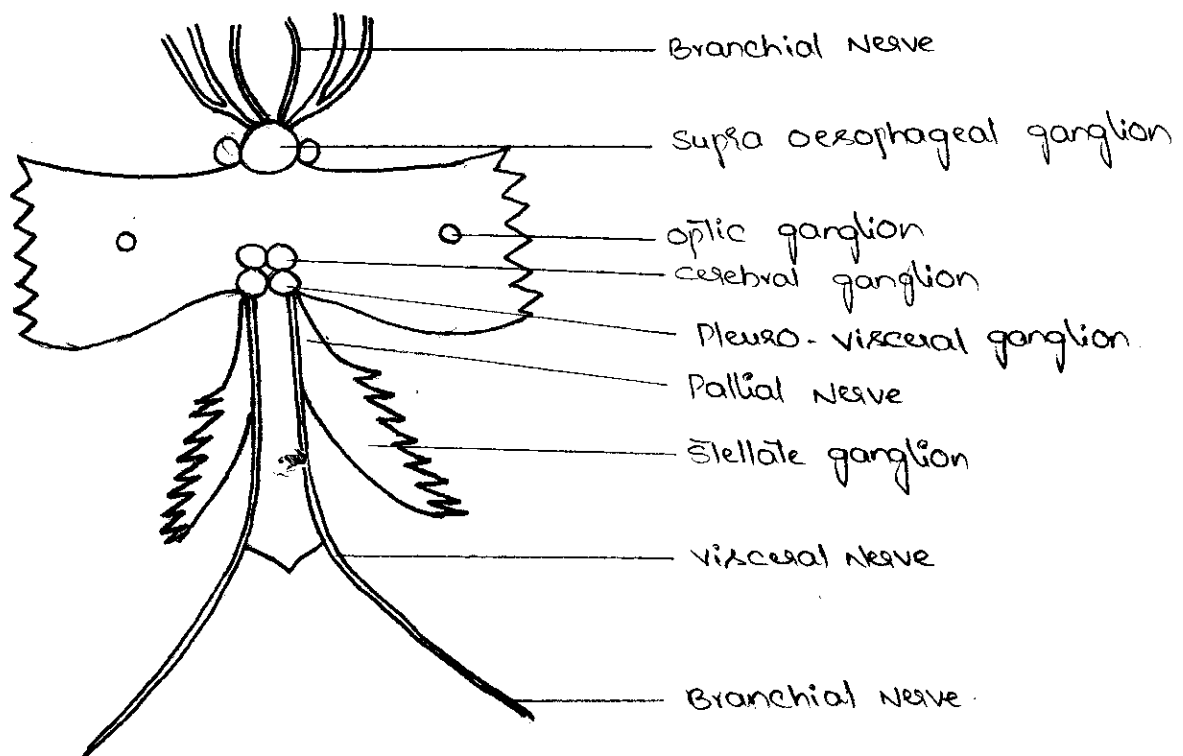
*Paratelphusa masoniana* (Fresh-water crab)



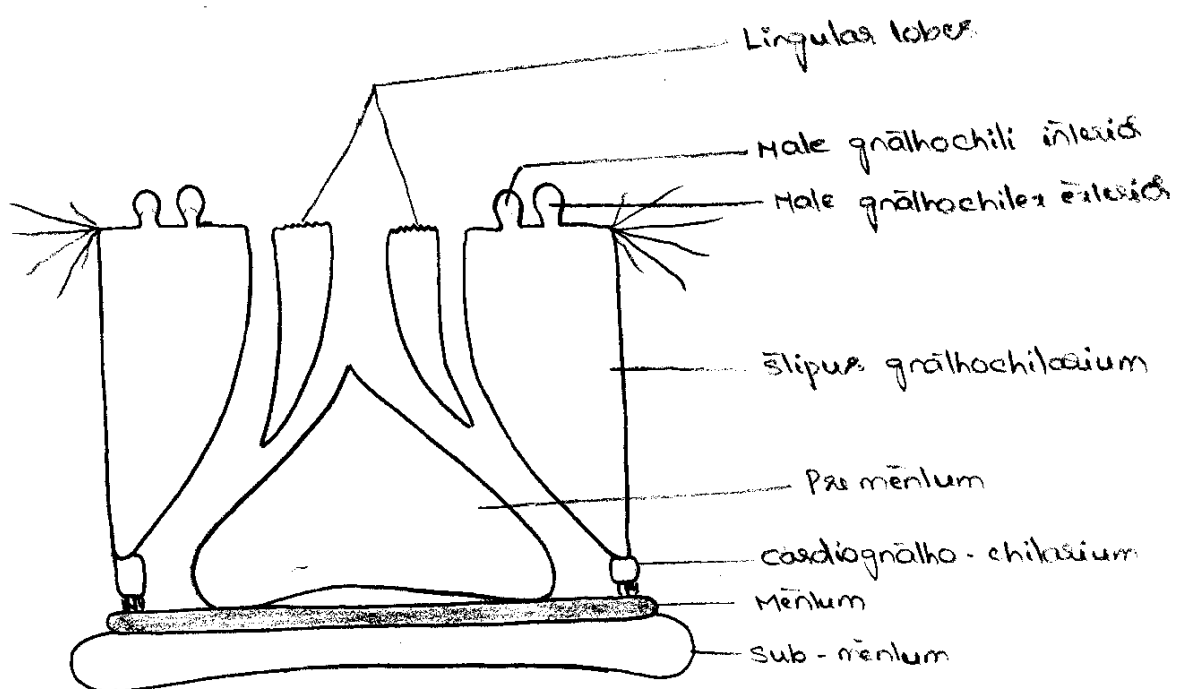
## SQUILLA NERVOUS SYSTEM



## SEPIA NERVOUS SYSTEM

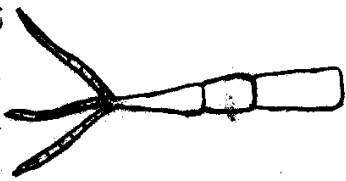


## GNATHOCHILARIUM OF MILLIPED

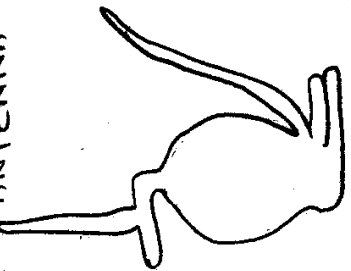


SQUILLA APPENDAGES

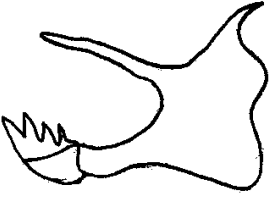
FIRST ANTENNA



2<sup>ND</sup> ANTENNA



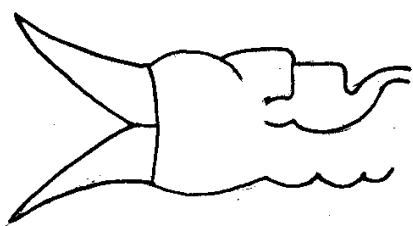
MANDIBLE



1<sup>ST</sup> MAXILLA



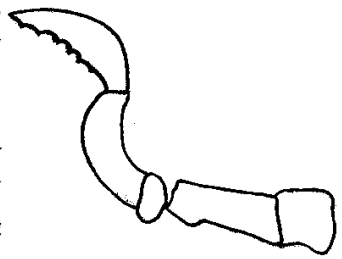
SECOND MAXILLA



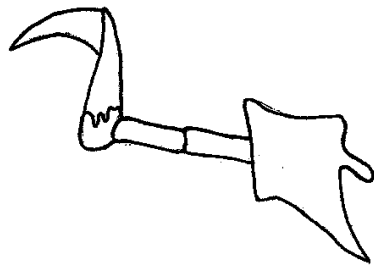
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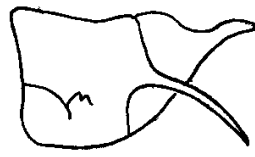
3<sup>RD</sup> MAXILLIPED



THORACIC LEG

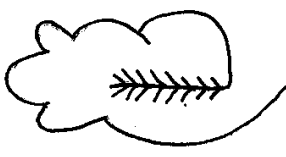


PLEOPOD WITHOUT BRANCHIAL FILAMENT

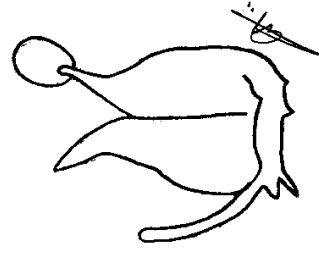


PLEOPOD WITH BRANCHIAL FILAMENT

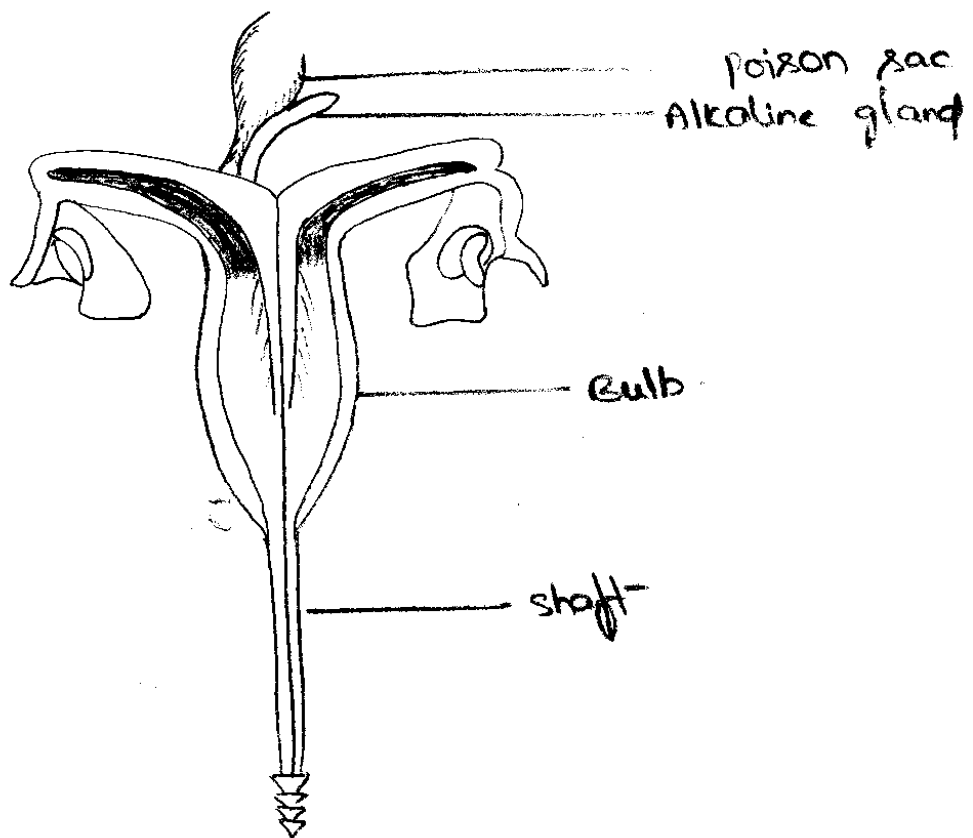
WITH BRANCHIAL FILAMENT



UROPOD



## STING OF HONEY BEE



***POLYSTOMELLA (Elphidium)***

Phylum : Protozoa  
Class : Sarcodina  
Order : Foraminifera  
Genus : *Polystomella*

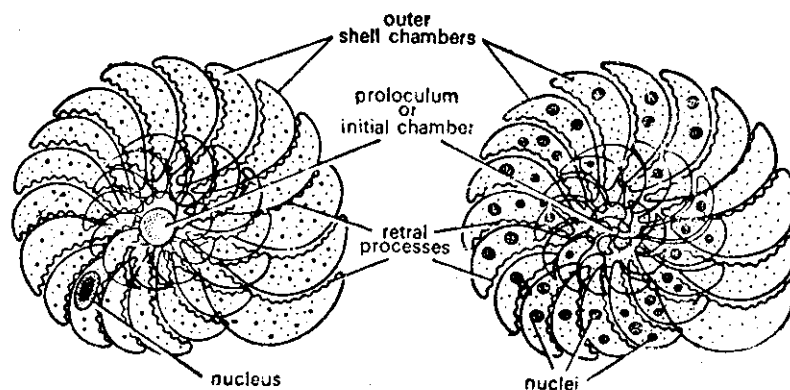


Fig. 1. *Polystomella*

**Habit and habitat:** *Polystomella* is a marine form found near the bottom of the sea.

**Characters:**

1. Body is enclosed in a shell of calcium carbonate.
2. The shell has many chambers (multilocular) which communicate with one another.
3. The shell is also perforated by many pores through which protoplasm flows out.
4. Pseudopodia radiate from the external protoplasm long, delicate, and often anastomosing reticulopodia are used in food trapping and locomotion.
5. Contractile vacuole absent.
6. *Polystomella* is dimorphic. It occurs in two distinct forms, viz., macrospheric and microspheric differing from one another in the size of the central chamber and the number of nuclei.
7. The animal feeds on diatoms and protozoans.
8. Reproduction by multiple fission. Life cycle shows an alternation of generation.
9. New chambers are added in a spiral manner so that the shell is like that of some snails.
10. It is a multilocular form having many chambered shell. It begins in a single chamber, the proloculum as the animal increases in size.



## *CERATIUM*

### Classification:

Phylum	.. Protozoa
Subphylum	.. Plasmodroma
Class	.. Mastigophora
Order	.. Dinoflagellata
Genus	.. <i>Ceratium</i>

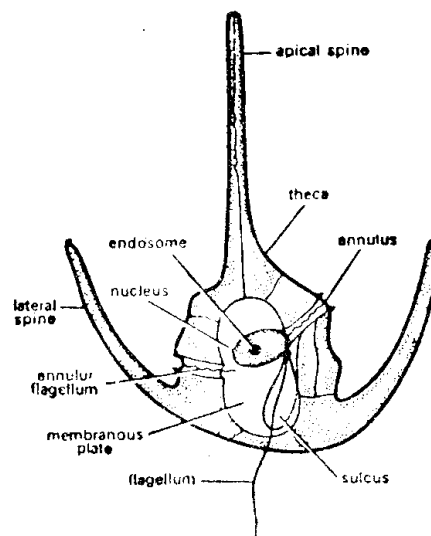


Fig. \_\_\_ *Ceratium*

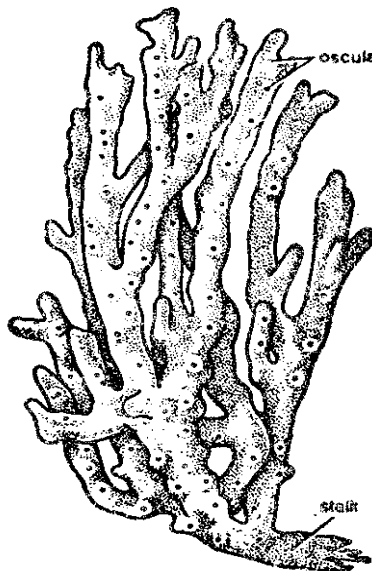
### Characters

1. Body is usually covered with a grooved cellulose wall known as lorica or theca.
2. The covering of the body consists of variable number of plates which are variously sculptured.
3. Shape of the body is triangular due to the presence of an anterior or apical and two lateral spines or horns.
4. There are two grooves on the shell or theca, a transverse and a longitudinal, each containing a flagellum which projects out through a pore.
5. Transverse groove is called annulus and runs like a circular or spiral girdle around the body.
6. Longitudinal groove or sulcus extends obliquely backwards.
7. Single large and central nucleus.
8. Chromatophores are numerous, green in fresh-water forms and yellow or brown in marine forms.
9. Reproduction by fission. Cyst formation also occurs.

## *CHALINA*

### Classification

Phylum	Porifera
Class	Demospongiae
Order	Haplosclerina
Genus	<i>Chalina</i>



### Characters

1. The sponge is orange or red, yellowish brown in colour.
2. *Chalina* is popularly known as dead man's finger because it is shaped like a hand with many fingers. It is also known as Mermalid's gloves.
3. The surface of the body is flattened consisting of bunches of finger-like branches.
4. Each branch or finger like structure is perforated by numerous oscula.
5. Skeleton comprises spongin fibres in which siliceous spicules are embedded.
6. Reproduction both asexual and sexual. Asexual by regeneration and budding. Sexual by producing free-swimming larva.
7. The spicules are silicious and monoxons.
8. Growth pattern is dependent upon various factors like availability of space, type of substratum and velocity and type of water currents. Its shape is an adaptation to different environmental factors.

## *PHYSALIA*

### Classification:

Phylum	Coelenterata
Class	Hydrozoa
Order	Siphonophora
Genus	<i>Physalia</i>

### Characters

1. *Physalia* is a colonial hydroid commonly known as Portuguese man of war.
2. Colony has a large pneumatophore or float which is brilliantly coloured as blue or purple.
3. The float or pneumatophore is bladder-like, elongated pointed at both the ends, 6 to 12 cm long. The upper surface of the float is produced into a crest or sail.
4. A gas gland present inside the float secretes a gas of a composition similar to air. This helps the animal in floating over the surface of water.
5. The swimming bells or nectocalyces are absent.
6. Colony exhibits remarkable polymorphism and the phenomenon of division of labour.
7. Beneath the float are hanging down the three types of zooids and tentacles.
  - (i) Gastrozooids are simple polyps with mouth but without tentacles. These are nutritive in function.
  - (ii) Dactylozooids are of two types, large as well as small. These are provided with tentacles bearing numerous nematocysts. These catch the fishes and other prey, etc.
  - (iii) Conozooids are branching blastostyles bear clusters of medusae. Male medusae are reduced and remain attached. Female medusae are free-swimming.
8. Tentacles are large and bear stinging batteries or nematocysts to kill the large fishes and prey.

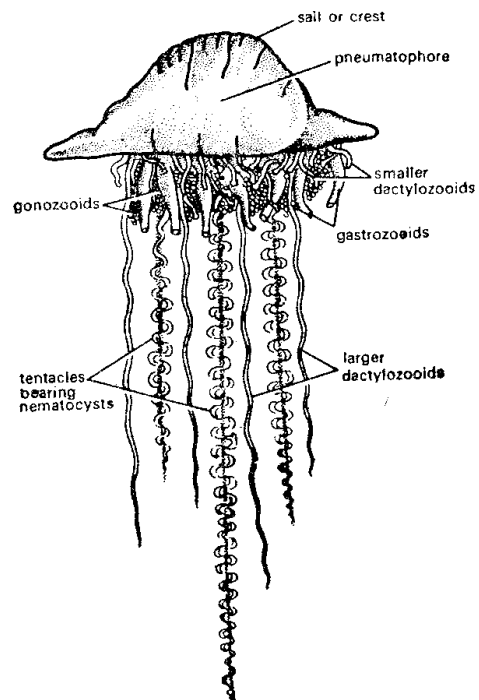


Fig. \_\_ *Physalia*

## *FUNGIA*

### Classification:

Phylum	Coelenterata
Class	Anthozoa
Order	Madreporaria

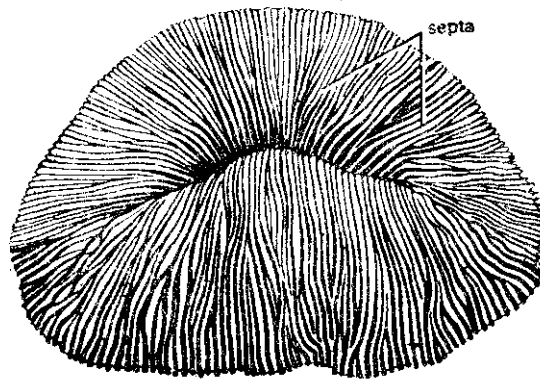


Fig. \_\_ . *Fungia*

**Habit and habitat:** *Fungia* is a solitary and marine coral found in warm seas usually in Gulf of California.

### Characters:

1. *Fungia* is commonly known as mushroom coral.
2. The mushroom coral is of large size; with discoidal corallite, convex on the upper and concave on the lower surface.
3. Septa are numerous and connected together by small synaptacula.
4. Theca is present only on the lower surface.
5. Adult animal bears a single large polyp with many tentacles.
6. Siphonoglyph absent.
7. Reproduction resembling more or less transverse fission.
8. Also known as stony coral, produce a  $\text{CaCO}_3$  skeleton. Skeleton is secreted by the epidermis of the lower half as well as the basal disc. This secreting process produce a cup, within which the polyp is fixed.

## *METRIDIUM*

### Classification:

Phylum	Coelenterata
Class	Anthozoa
Order	Actiniaria

**Habit and habitat:** *Metridium* is a large sessile, brightly coloured, solitary, flower-like, form. It is a marine form, found attached to the rocks, piles of wharves and solid objects from tide pools to a depth of 90 fathoms.

### Characters:

1. *Metridium* is commonly known as **sea anemone**.
2. Body is short, cylindrical and radially symmetrical, divisible into three distinct regions, pedal disc, column and oral disc.
3. Pedal disc is muscular broad base or foot by which it is attached to the substratum.
4. Column is differentiated into two portions, a distal thin-walled short capitulum and a proximal thick-walled scapus by a groove and collar.
5. The wall of the scapus is perforated by small openings called cinclides
6. Oral disc is lobed and flat having a slit-like mouth in the centre which is surrounded by numerous short, hollow marginal tentacles arranged in a number of circles.
7. Mouth leads into a short gullet which finally opens into the gastrovascular cavity.
8. Gullet or stomodaeum is provided usually with one or two siphonoglyphs.
9. Gastrovascular cavity is divided into compartments usually by six pairs of mesenteries.
10. Sexes are separate. Gonads are borne on the mesenteries.
11. Asexual reproduction by fragmentation and budding.

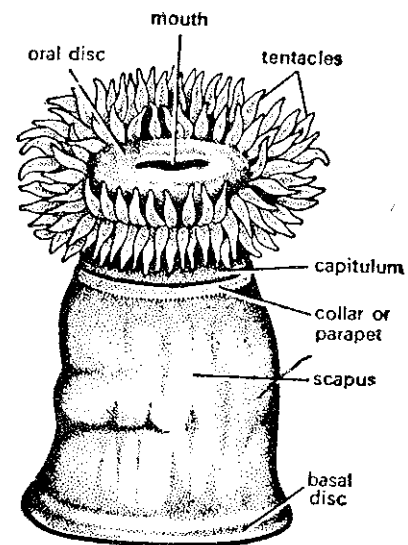


Fig. \_\_ . *Metridium*

## *PLANARIA (Dugesia)*

### Classification:

Phylum	Platyhelminthes
Class	Turbellaria
Order	Tricladida
Genus	<i>Planaria</i>

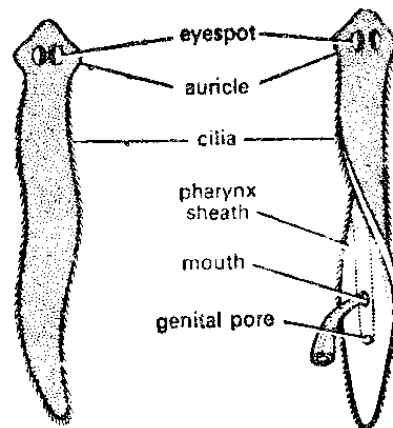


Fig. \_\_ *Planaria*

**Habit and habitat:** *Planaria (Dugesia)* is a fresh-water triclad. It is found in the fresh-water streams, springs, ponds and lakes under the stones throughout the temperate zones.

### Characters:

1. Body is elongated, bilaterally symmetrical and dorsoventrally flattened.
2. They are 2-15 mm in length and brown to black in colour.
3. Head is triangular with conspicuous auricles and two eyes.
4. Digestive system consists of mouth, proboscis, pharynx and branched intestine.
5. Mouth is situated on the ventral surface behind the middle of the worm.
6. Proboscis is enclosed in the proboscis sheath.
7. Pharynx plicate directed backwards.
8. Intestine forks into three diverticulated branches, one anterior and two posterior.
9. Genital pore is situated a little posterior to the mouth.
10. Reproduction sexual, asexual and by regeneration.
11. *Planarians* are extensively used for the experimental purpose, e.g., regeneration and grafting, etc.

## *FASCIOLA*

### Classification:

Phylum	Platyhelminthes
Class	Trematoda
Order	Digenea
Genus	<i>Fasciola</i>
Species	<i>hepatica</i>

**Habit and habitat:** *Fasciola hepatica* is found as an endoparasite in the bile ducts of liver of sheep.

### Characters:

1. *Fasciola hepatica* commonly known as liver fluke.
2. Body is leaf like, dorso-ventrally flattened measures 25-30 mm in length and 4-5 mm in breadth.
3. Anterior end is small and conical, while the posterior end is large more rounded in front than behind.
4. An oral sucker is situated apically and a larger highly muscular ventral sucker (acetabulum) is located a little posterior to the oral sucker.
5. Mouth is situated at the anterior end and is surrounded by the oral sucker.
6. Digestive system is simple, pharynx is muscular, oesophagus short and branched and diverticulated intestine.
7. Between the oral and ventral sucker is a median genital pore through which pass eggs to the exterior.
8. Excretory pore lies at the extreme posterior end of the body.
9. Hermaphroditic. Male system consists of tests, vasa deferentia, seminal vesicle, ejaculatory duct and penis, while female system comprises ovary, uterus and vitelline glands.
10. Life cycle is complicated includes an intermediate host, *Lymnaea* a mollusc.
11. Liver-fluke causes a disease known as liver rot.

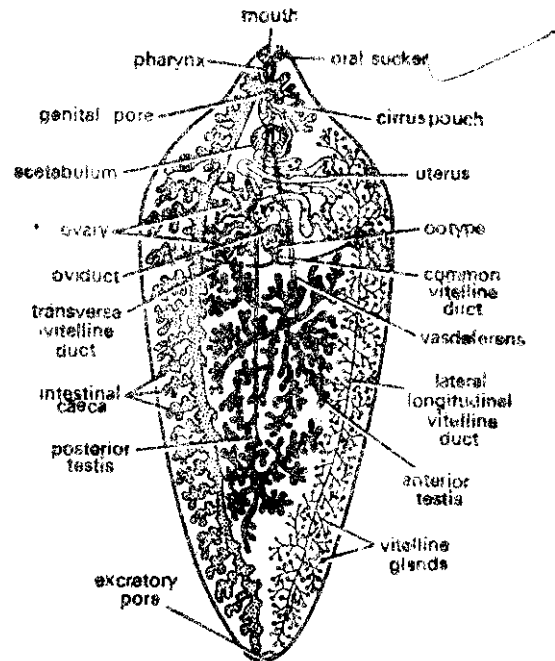


Fig. \_\_ *Fasciola hepatica*

### *Cercaria Larva of Fasciola hepatica*

#### Comments:

1. Body of cercaria is flat and oval bearing a tail.
2. Body is covered by cuticle and body wall consists of cuticle, muscles and mesenchyme.
3. It has two suckers, an anterior oral sucker surrounding the mouth and a ventral sucker situated in the middle of body.
4. Digestive system comprises, mouth, muscular pharynx, oesophagus and inverted “ $\Pi$ ” shaped intestine.

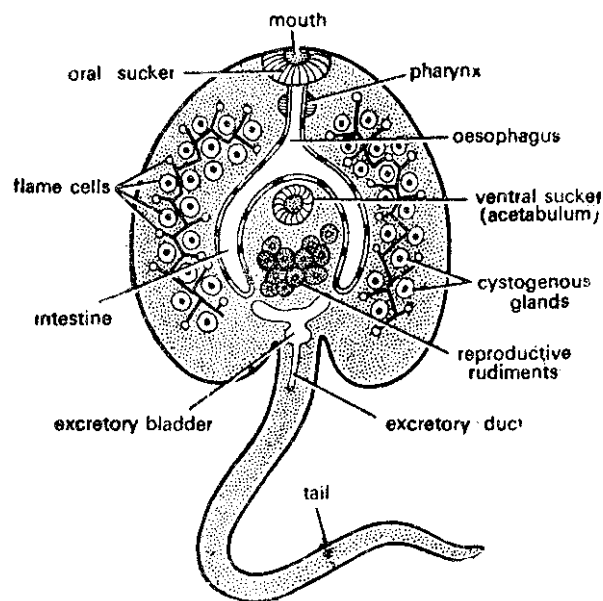


Fig. \_\_\_\_. *Cercaria* larva of *Fasciola hepatica*.

5. Excretory organs of the flame cell type are present.
6. Body space is filled with parenchyma and contains a few cestogenous glands on each side which form the cyst of the future larva.
7. Rudimentary reproductive organs are also seen.
8. Cercaria larva comes out from the redia through the birth pore and also from the body of snail.
9. It is a free-swimming larva and after swimming for a short period it attaches to the aquatic plants.
10. Finally cercaria larva undergoes encystment and the encysted larva is known as metacercaria which is swallowed by the final host, sheep.



## ***CYSTICERCUS LARVA OF TAENIA SOLIUM***

### **Comments:**

1. Cysticercus larva is also known as bladder-worm and develops in the muscles of pig, the intermediate host.
2. The onchospheres first reach the stomach of pig with faeces of man.
3. The onchospheres further migrate to the muscles where the hooks are lost and the cells in the centre of the embryo disappear and thus producing a single layered large ovoid bladder known as bladder worms or cysticercus.

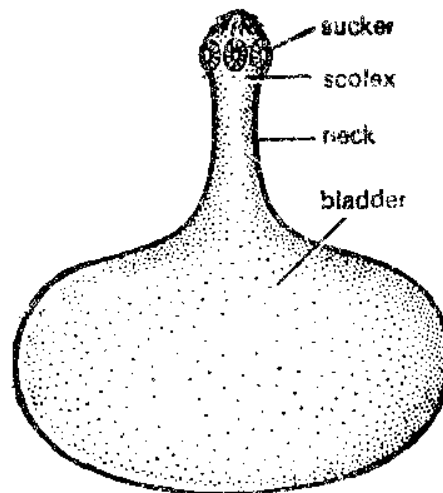


Fig. \_\_\_ *Cysticercus* larva of *Taenia solium*.

4. As the bladder increases in size an invagination takes place at one side.
5. On this invagination suckers and hooks are formed and this part is known as prosclex.
6. The further development of cysticercus larva takes place when it is eaten by man with the muscles of pig.
7. Cysticercus consists of a sac or bladder-like structure, having invaginated prosclex measuring 6-18 mm in length.
8. The bladder is opalescent made up of a single layer and filled with a fluid.
9. The contaminated part of pig muscles is called measly pork.
10. Cysticercus in measly pork is found between muscle fibres and connective tissue.
11. If raw pork is ingested by man, the cysticercus is freed, the scolex evaginates and an adult worm develops.

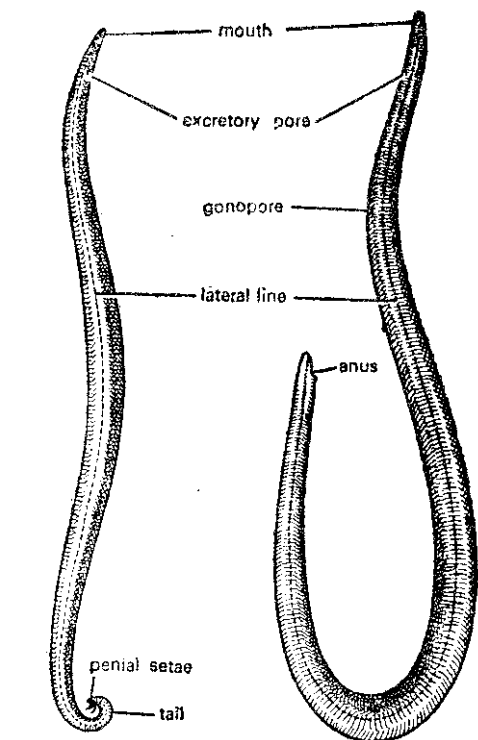
**ASCARIS****Classification**

Phylum	Aschelminthes
Class	Nematoda
Order	Ascaroidea
Genus	<i>Ascaris</i>
Species	<i>Lumbricoides</i>

**Habit and habitat:** *Ascaris lumbricoides* is a common endoparasite in the small intestine of man in all parts of the world.

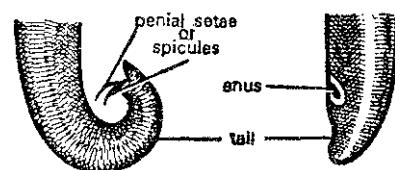
**Characters:**

1. *Ascaris lumbricoides* is commonly known as round worm.
2. Body is elongated, cylindrical, pointed at both ends.
3. Surface of the body is marked with four longitudinal lines, these are known as mid-dorsal, midventral and two lateral lines.
4. Mouth provided with a median dorsal and a pair of symmetrical submedian ventral lips.
5. Excretory pore is small and lies on the ventral side about 2 mm away from the anterior end.
6. Sexes are separate and sexual dimorphism is well marked.
7. Male is about 15 to 31 cm in length with the posterior end curved ventrally.
8. Male is provided with a pair of curved spicules known as penial setae on its posterior end.
9. Female is large reaching a length of 20 to 35 cm with the posterior end straight and blunt.
10. Female genital aperture lies about one-third of the length of the body from the anterior end.



ASCARIS MALE

ASCARIS FEMALE



Posterior end of male. Posterior end of female.  
*Ascaris*.

## **CHAETOPTERUS**

### Classification:

Phylum	Annelida
Class	Polychaeta
Order	Sedentaria
Genus	<i>Chaetopterus</i>

**Habit and habitat:** *Chaetopterus* lives in parchment-like U-shaped tubes open at both the ends embedded in the mud encrusted with sand and debris.

### Characters:

1. *Chaetopterus* is usually 15 to 25 cm length.
2. The body is divisible into three distinct regions, anterior, middle and posterior.
3. The anterior region is flat and bears usually nine pairs of simple parapodia which are large expanded notopodia, a small prostomium and a funnel-shaped peristomal collar with a pair of peristomial cirri.
4. The middle region comprises five segments, first anterior most is produced laterally into great wings directed forwards, next segment carries a pair of sucker and the rest three segments carry membranous folds so called fans formed by the fusion of the notopodia.
5. The posterior region comprises thirty similar segments which are devoid of setae.
6. Mouth is wide and funnel-shaped.
7. The food comprises mainly small organisms which are carried in by the currents of water set up by fans.
8. *Chaetopterus* is highly phosphorescent emits blue-green light.
9. Reproduction is usually asexual and by transverse fission.

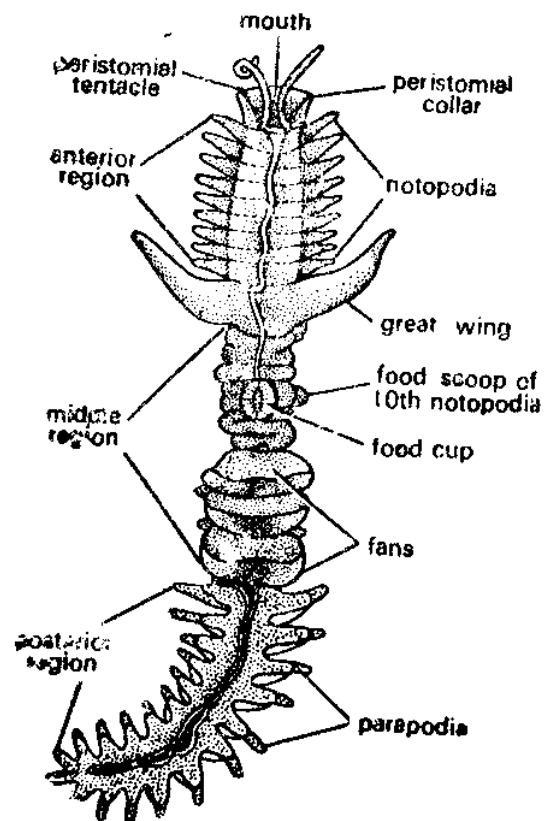


Fig. \_\_\_ *Chaetopterus*

## ***POLYNOE***

### **Classification:**

Phylum	Annelida
Class	Polychaeta
Order	Errantia

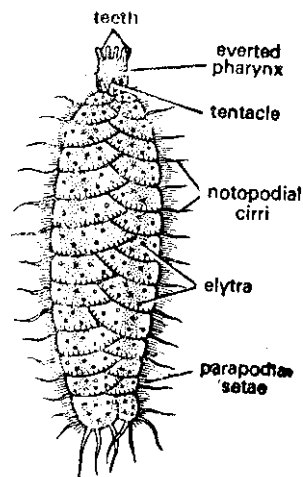


Fig. \_\_ *Polynoe*

**Habit and habitat:** *Polynoe* is marine form and found near the shores hidden under stones.

### **Characters:**

1. Body is short, broad and oval with few segments.
2. It has a covering of elytra which are modified dorsal cirri.
3. Elytra do not contain setae and have rich nerve supply.
4. The illuminating elytra are easily cast off when disturbed or elytra are shed off to deceive the enemies.
5. Head bears three tentacles and two pairs of peristomial cirri.
6. Pharynx is protrusible.
7. It is carnivorous and said to eat one another.
8. Several species of *Polynoe* are phosphorescent.
9. The fertilized ova and embryos adhere to masses under each elytra.

## ***STREPTOCEPHALUS***

### **Classification:**

Phylum	Arthropoda
Class	Crustacea
Order	Branchiopoda

**Habit and habitat:** *Streptocephalus* has the peculiar habit of swimming on its back near the surface of water with its leaf-like appendages and occurs in fresh-water ponds and ditches.

### **Characters:**

1. *Streptocephalus* is commonly known as fairy shrimp
2. Body is long and subcylindrical, beautiful orange red colour.
3. Carapace or dorsal shield is absent.
4. Body can be distinguished into three regions, head, thorax and abdomen.
5. Sexual dimorphism is common, i.e., male and female are easily distinguishable.
6. Head bears a pair of antennules, a pair of antennae, a pair of mandibles and two pairs of maxillae.
7. In male antennae are long and modified for holding female during copulation.
8. On the dorsal side of the head a nuchal sense organ and a median eye are present.
9. Trunk consists of nineteen segments, of these the first eleven segments bear each a pair of broad foliaceous appendages.
10. The twelfth trunk segments carries the genital opening.
11. The segments from 13 to 19 constitute the abdomen which is devoid of appendages.
12. Anus lies ventrally in front of the telson.

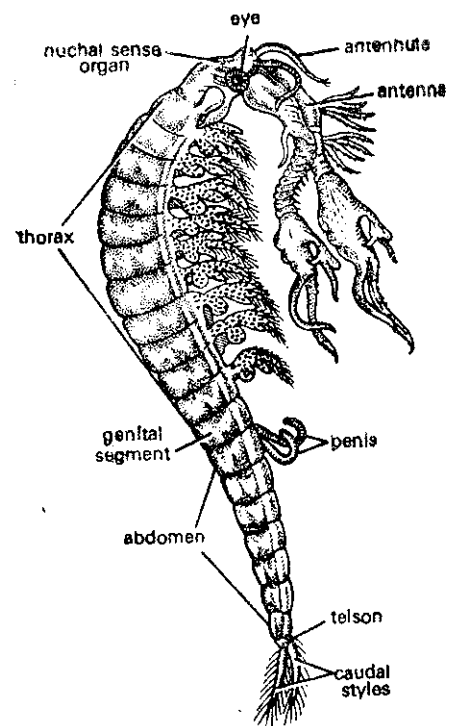
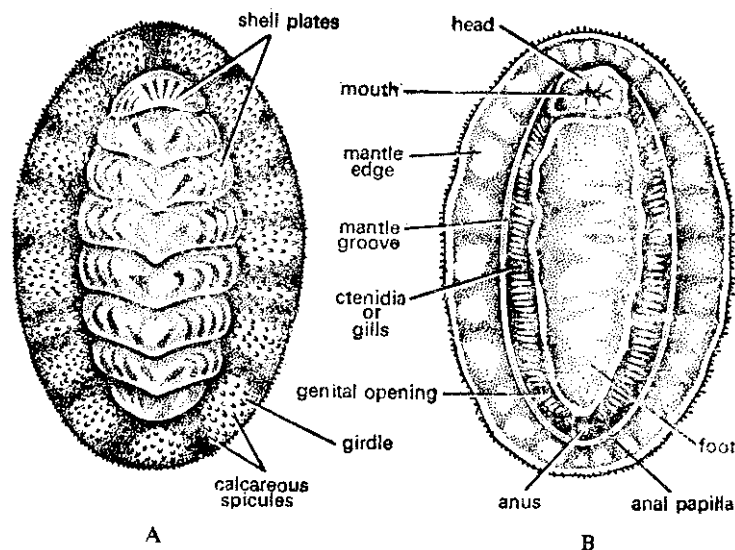


Fig. \_\_ . *Streptocephalus* (Male)

**CHITON****Classification:**

Phylum	Mollusca
Class	Polyplacophora
Order	Chitonina

Fig. \_\_\_ *Chiton*

A-Dorsal view; B-Ventral view

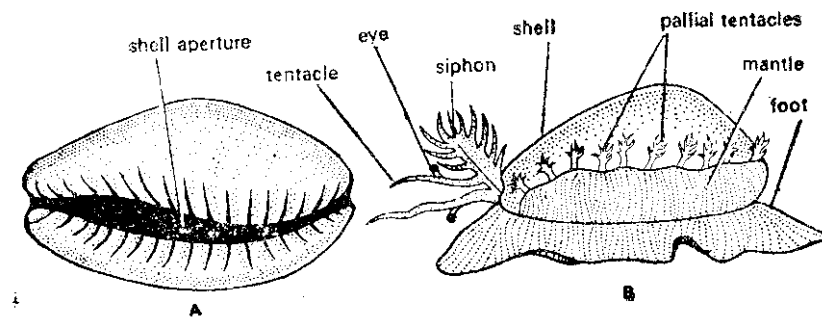
**Habit and habitat:** *Chiton* is a sluggish, marine animal found attached to the rocks, empty shells and corals between tide marks.

**Characters:**

1. Shell is calcareous, present on the dorsal side and composed of eight overlapping plates.
2. Head is not distinct. Eyes and tentacles are absent.
3. Body is elongated, bilaterally symmetrical and dorsoventrally compressed and consists of shell, foot, mantle and the visceral mass.
4. Foot is ventral, muscular with a flat sole extending along the whole length of the body. It serves for creeping and adhering to the substratum.
5. Mantle covers greater part of the body and partly covers the edges of the shell plates.
6. Mouth and anus are at opposite ends.
7. Numerous pairs of bipectinate ctenidia lying on either side of the body in the mantle groove.
8. Sexes are separate, gonad is single and median and gonoducts are paired.
9. Development includes a trochophore larva.
10. Chitons are macrophagous.
11. Each plate is similar to others except for the first and last, the cephalic and anal plates.

**CYPRAEA****Classification:**

Phylum	Mollusca
Class	Gastropoda
Order	Mesogastropoda

Fig. \_\_ *Cypraea*

**Habit and habitat:** *Cypraea* is marine and found in Indian and Pacific oceans among coral reefs and rocky ground.

**Characters:**

1. *Cypraea* is commonly called cowry.
2. The shell is convolute, oval above and flattened below.
3. The surface of the shell is smooth, polished and brightly coloured.
4. Shell opening is long, narrow and serrated.
5. Mantle is reflected over the shell laterally and provided with tentacular filaments.
6. Operculum is absent.
7. In the young stages, the shell has a prominent spire and long siphon.
8. The shells of cowry were used for ornaments and as coin in olden days in India.
9. Ctenidium monopectinate and attached to mantle.
10. Ventrally flattened foot is present.
11. Spine enclosed within the last whorl of shell.

**ANTEDON****Classification:**

Phylum	Echinodermata
Class	Pelmatozoa
Order	Articulata

**Habit and habitat:** *Antedon* is marine, found at moderate depths attached to the rocks and stones.

**Characters:**

1. *Antedon* is commonly known as feather star.
2. Body consists of a central disc or calyx and a series of five radiating arms.
3. Central disc or calyx is differentiated into an upper oral surface and lower aboral surface.
4. Oral surface is covered with a soft and leathery skin, the tegmen bearing the central mouth and the anus on a papilla in an inter-radius.
5. Aboral surface bears several slender cured joined cirri supported by small ossicles which serve for attachment.
6. Each arm divided at its base into two, so that there are ten long slender flexible arms, bearing lateral pinnules.
7. Five ambulacral ciliated grooves radiate from the mouth towards the arms, where each divide into two and the branches extend along the oral surface of the arms.
8. Tube feet or podia without suckers present along the edges of ambulacral grooves.
9. Sexes are separate, gonads contained in the dilated bases of pinnules.
10. Development includes a pentacrinoid larva with jointed stalk.
11. The tegmen is supported by loose spicules. On the lower side of the calyx is knob like structure which is the stung of the stalk by which the animal was originally attached.

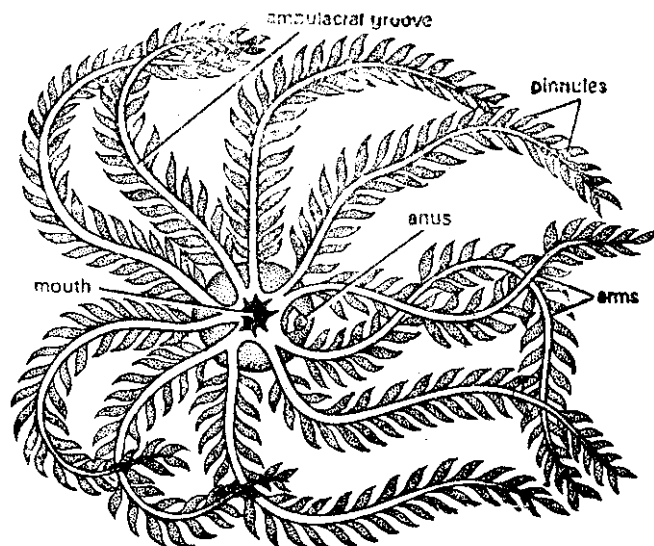


Fig. \_\_ *Antedon*



## ***HOLOTHURIA***

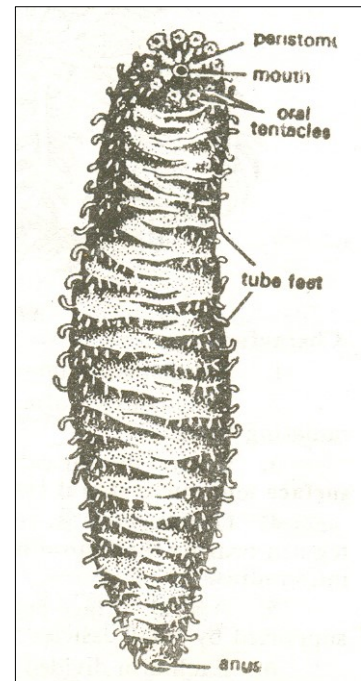
### **Classification:**

Phylum	Echinodermata
Subphylum	Eleutherozoa
Class	Holothuroidea
Class	Aspidochirota
Genus	<i>Holothuria</i>

**Habit and habitat:** *Holothuria* is found in shallow tropical seas.

### **Characters:**

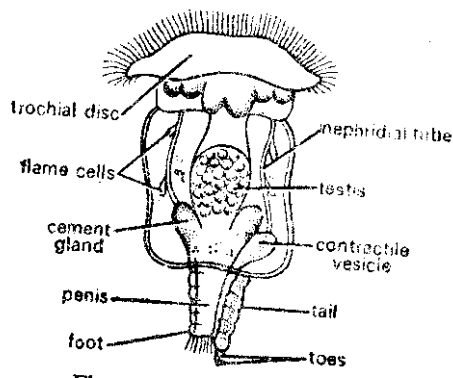
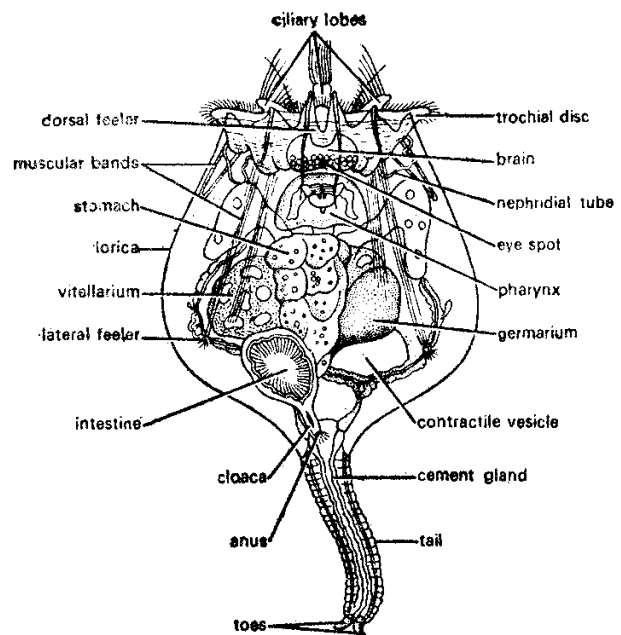
1. Body is elongated, bilaterally symmetrical bearing the mouth and anus at opposite ends.
2. Body bears numerous podia or tube feet, locomotory on the ventral surface and papillate on the dorsal surface.
3. Body wall is leathery having a skeleton of minute ossicles.
4. Mouth is anteriorly placed, surrounded by 15-30 peltate tentacles.
5. Respiratory tree is well developed.
6. Cuvierian tubule are also present.
7. Madreporite is internal.
8. Sexes are separate, gonad single tuft attached to left side of the dorsal mesentery.
9. Development includes auricularia larva.
10. *Holothuria* feeds by pushing sand containing organic food into mouth with the help of tentacles.



DFig. \_\_  
Holochuria

**BRACHIONUS****Classification:**

Phylum	Rotifera
Order	Monogonata
Genus	<i>Brachionus</i>

Fig. \_\_ *Brachionus* (Male)Fig. \_\_ *Brachionus* (Female)

**Habit and habitat:** *Brachionus* is a fresh-water rotifer, found in abundance in ponds and ditches, etc.

**Characters:**

1. *Brachionus* is commonly known as wheel animalcule.
2. It is microscopic. The female measures about 1/3 mm in length.
3. The body is divisible into two distinct parts – a broad anterior region, the trunk and a slender movable tail.
4. The trunk is enclosed in a glassy cuirass or lorica formed by the thickening of the cuticle.
5. The tail is wrinkled superficially and ends in two slender processes, the toes.
6. Dorsal surface of the trunk is convex, while the ventral surface is fattened and bears the mouth.
7. The anterior portion of the body projects from the lorica in the form of a transverse disc, the trochial disc with a prominent edge fringed with cilia.
8. Three ciliary lobes are present at the anterior end.
9. The anus is dorsal in position and is placed at the junction of the tail with the trunk.
10. Sexes are separate.

## *SIPUNCULUS*

### Classification:

Phylum	Annelida
Class	Sipunculoidea
Genus	<i>Sipunculus</i>

**Habit and habitat:** *Sipunculus* is found in burrows in sand or crevices in rocks at moderate depth off the coast in most countries outside the tropics.

### Characters:

1. Body is elongated and cylindrical worm-like without segmentation.
2. Parapodia and setae are absent.
3. Anterior part of the body is slightly narrower than the posterior part. The narrow anterior part can be drawn into larger posterior portion and is, therefore, called introvert.
4. The introvert is covered with chitinous papillae and bears terminal mouth surrounded by tentacular folds.
5. Posterior part is marked by a series of squarish area due to crossing of transverse and longitudinal muscles and devoid of papillae.
6. Anus is placed anterodorsally at the base of introvert.
7. Coelom is spacious traversed by strands of connective tissue and muscle fibres.
8. Single pair of nephridia lying in the anterior region of the body.
9. Sexes are separate.
10. Development is indirect having a trochophore larva.

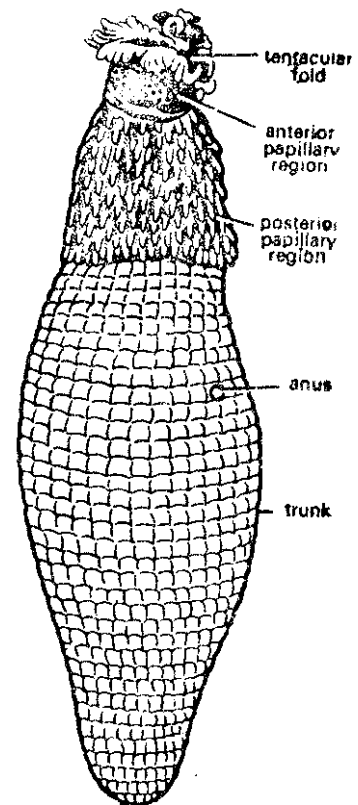


Fig. \_\_ *Sipunculus*

## LINGULA

### Classification:

Phylum	Brachiopoda
Order	Inarticulata
Genus	<i>Lingula</i>

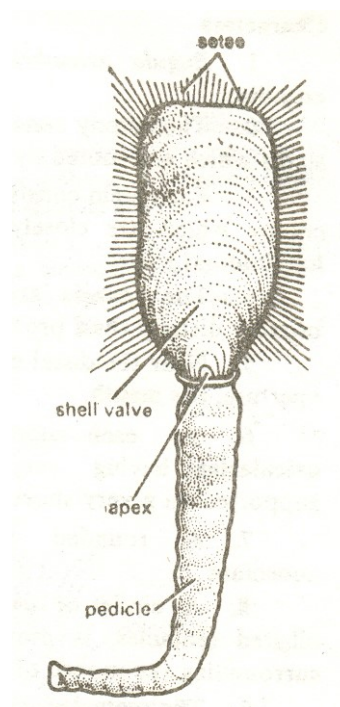


Fig. \_\_ *Lingula*

**Habit and habitat:** *Lingula* lives in vertical burrows in the bottom sand. It is found in the tropical and subtropical waters of the Indo-West Pacific area.

### Characters:

1. Body is covered by a shell.
2. Shell consists of two valves which are nearly alike, oblong and ore or less convex.
3. Shell valves are not united by a hinge.
4. A long pedicle passes out between the proximal end of two valves.
5. There is no shell loop for the support of the lophophore.
6. Intestine is very large and anus is present.
7. Nephridia are exceptionally broad and flattened.
8. The two valves are only held together by muscles. The shell is secreted by the underlying dorsal and ventral mantle lobes.
9. Mantle lobes bears chitinous setae which are believed to have protective and sensory function.

## *SAGITTA*

### Classification:

Phylum	Chaetognatha
Genus	<i>Sagitta</i>

**Habit and habitat:** *Sagitta* is a planktonic animal, found in large number in both littoral waters and the open sea. It feeds actively on unicellular plants and animals, crustacean larvae and other small marine animals.

### Characters:

1. *Sagitta* is commonly known as arrow worms.
2. The body is elongated and nearly cylindrical and is divisible into head, trunk and tail.
3. The head is marked off by its somewhat rounded form.
4. The junction of trunk and tail is indicated by the ventrally placed anus.
5. Tail bears a horizontal expansion the caudal fin.
6. Trunk bears two lateral fins.
7. Mouth is ventral and have bristles around it.
8. Anus is also placed ventrally at the junction of trunk and tail.
9. Coelom is spacious and divided by mesenteries.

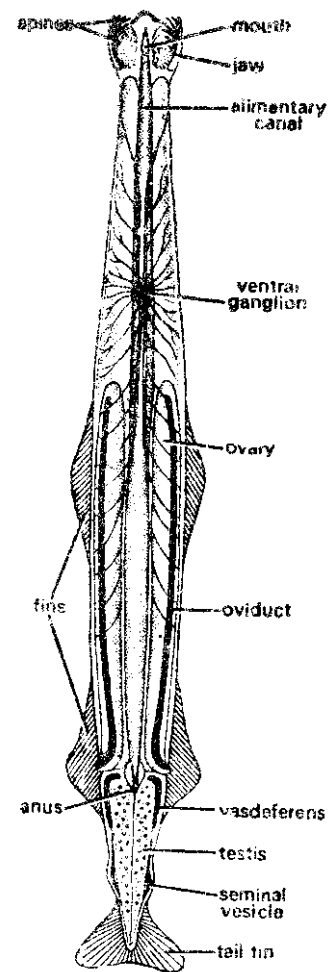


Fig. \_\_\_ *Sagitta* (Ventral view)

## VIRGULARIA

### Classification:

Phylum	Coelenterata
Class	Anthozoa
Order	Pennatulacea
Genus	<i>Virgularia</i>

**Habit and habitat:** *Virgularia* is a colonial and marine Anthozoa.

### Characters:

1. *Virgularia* is commonly called walking stick.
2. The body is divisible into proximal part which is curved and distal part, the rachis.
3. The rachis is elongated like walking stick.
4. the polyps or anthocodia are grouped and slightly fused into transverse or oblique rows lying at regular intervals along the stem.
5. The siphonozooids are found just below each row of polyps.
6. *Virgularia* is bioluminescent.

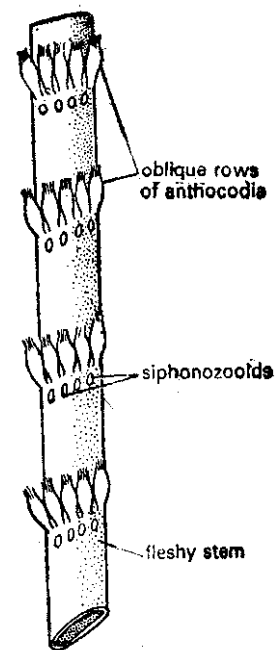


Fig. \_\_ *Virgularia*

## ***PTEROEIDES***

### **Classification:**

Phylum	Coelenterata
Class	Anthozoa
Order	Pennatulacea
Genus	<i>Pteroeides</i>

*Pteroeides* resembles *Pennatula* very much but differs from it in the following characters:

### **Characters:**

1. *Pteroeides* bears numerous small anthocodia or autozooids on the lateral pinnules, supported by a fan-like arrangement of spicules.
2. The siphonozooids are also found only on the pinnules.
3. Body is divided into an elongated proximal stalk (or) peduncle, devoid of anthocodia and a distal rachis, the region of secondary polyps.
4. Peduncle ends with an enlarged end bulb and found embedded in soft bottoms.
5. Peduncle bears on each side a succession of flattened fleshy leaves, provided with anthocodia.
6. Dimorphic, possesses autozooids and siphonozooids.

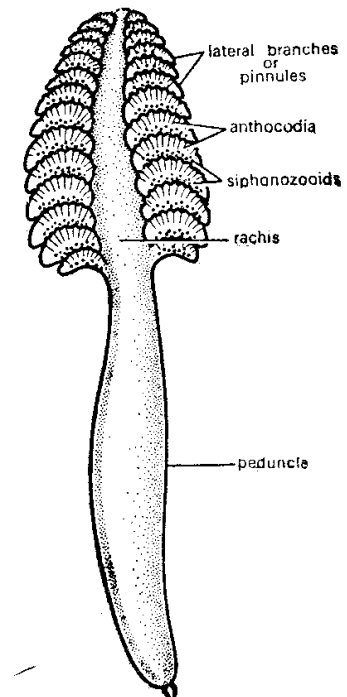


Fig. \_\_\_ *Pteroeides*

## *PENNATULA*

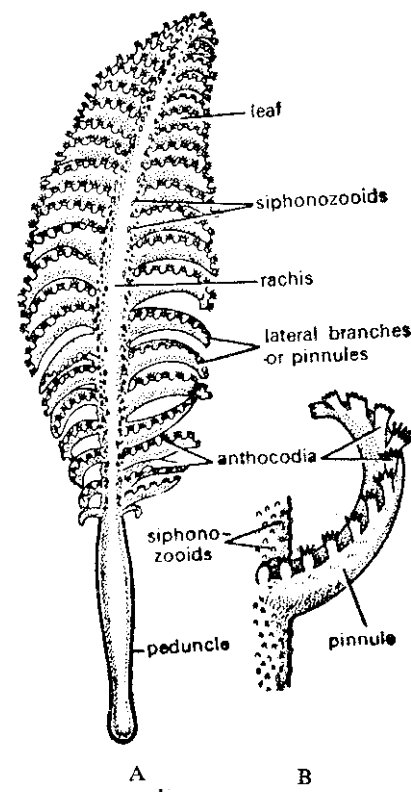
### Classification:

Phylum	Coelenterata
Class	Anthozoa
Order	Pennatulacea
Genus	<i>Pteroeides</i>

**Habit and habitat:** *Pennatula* is a sedentary and colonial Anthozoa. It is found fixed in the mud in deep waters of South Carolina.

### Characters:

1. *Pennatula* is commonly called as sea pen or sea feather.
2. Colony is elongated and bilaterally symmetrical divisible into two parts, the stalk and the rachis.
3. The proximal or basal part is called the stalk or peduncle embedded in the mud or sand. It is devoid of zooids.
4. The distal or upper part is called the rachis, bears rows of lateral fleshy projections known as leaves or pinnules.
5. Colony is dimorphic having two kinds of zooids:
  - (i) Autozooids
  - (ii) Siphonozooids
6. Skeleton consists of a long horny unbranched axis which supports the rachis and does not extend into lateral pinnules.
7. *Pennatula grandis* is about 50 cm in length. It is orange in colour.



A                      B  
Fig. \_\_ *Pennatula*



***PATELLA*****Classification:**

Phylum	Mollusca
Class	Gastropoda
Order	Archaeogastropoda
Genus	<i>Patella</i>

**Characters:**

**Habit and habitat:** *Patella* is a sluggish, marine gastropod, found attached to the rocks and feeding on minute algae.

1. *Patella* is commonly called true limpet.
2. It is a small oval gastropod.
3. Shell is oval and rounded without operculum.
4. Head is distinct bears a pair of stout, sensory tentacles and eyes.
5. Foot is ventral, broad and flat used for creeping and adhering.
6. True mantle cavity is restricted anteriorly and the ctenidia or gills have disappeared.
7. Secondary mantle cavity extends all round between the foot and mantle and contains a series of pallial gills or secondary branchiae for respiration.
8. Radula composed of very few, strong hooked teeth in each row.
9. *Patella* is eaten by poorer class in several countries like France, Italy and Ireland.
10. Single bipectinate gill is present within the mantle cavity.

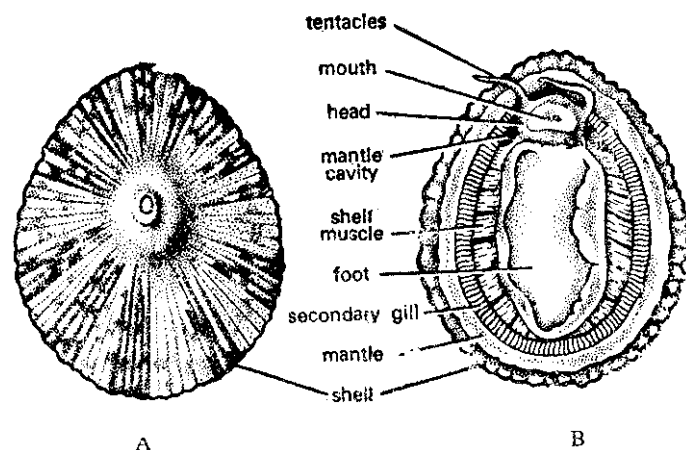


Fig. \_\_ *Patella*  
A-Dorsal view; B-Ventral view

## *MUREX*

### Classification:

Phylum	Mollusca
Class	Gastropoda
Order	<i>Neogastropoda</i>
Genus	<i>Murex</i>

### Characters:

**Habit and habitat:** *Murex* is a marine form found between low water mark and 100 fathoms.

1. Shell with a prominent spire and ornamental with spines.
2. Eyes placed at the base of tentacles.
3. Long proboscis and siphon well developed.
4. Radula with two or three teeth in each row.
5. Salivary glands and liver contain the proteolytic enzymes.
6. It is carnivorous feeding on living and dead animals.
7. Some species of *Murex* are destructive to Oyster beds.

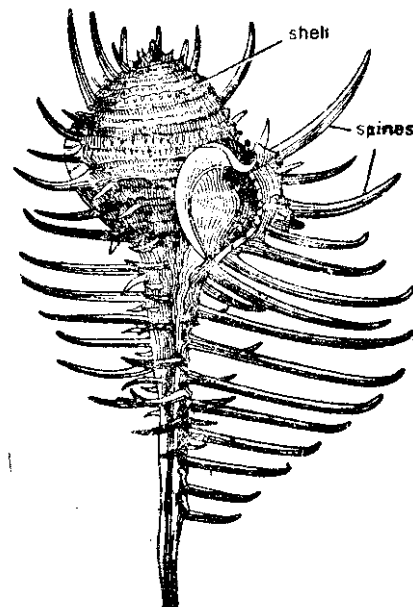


Fig. \_\_\_ *Murex*

## *ECHINUS*

### Classification:

Phylum	Echinodermata
Class	Echinoidea
Order	Camarodonia
Genus	<i>Echinus</i>

### Characters:

**Habit and habitat:** *Echinus* is marine, found in the sea in the rocky places.

1. *Echinus* is commonly known as sea urchin.
2. Body is globular in shape, somewhat flattened at the two poles forming distinct oral and aboral poles.
3. Body is enclosed in a rigid globular shell or corona formed of closely fitted calcareous plates.
4. Entire surface of the animal except the peristome and periproct is covered with spines articulated to the shell.
5. Pedicellariae with three jaws and sphaeridia are present among the spines.
6. Mouth lies in the centre of oral pole and is surrounded by soft membrane known as peristome, through the mouth project the five teeth of Aristotle's lantern.
7. At the aboral pole is a much smaller aperture, the anus surrounded by periproct.
8. The surface of the shell is divided into alternating ambulacral and inter-ambulacral areas.
9. Numerous podia or tube feet project from the surface among the spines. these are arranged in five double rows in ambulacral areas.
10. Sexes are separate. Gonads are five large masses.
11. Development includes a free-swimming echinopluteus larva.

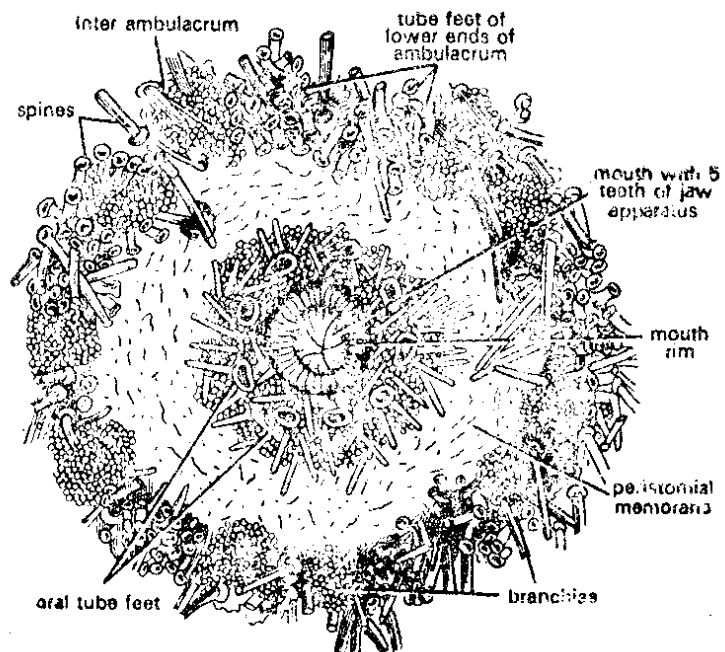


Fig. \_\_ *Echinus* (Oral view)

## *OPHIOTHRIX*

### Classification:

Phylum	Echicerdmata
Class	Ophiuroidea
Order	Ophiarae

### Characters:

**Habit and habitat:** *Ophiothrix* is marine and commonly found along Atlantic coast.

1. *Ophiothrix* is a common spiny brittle star.
2. It has a small rounded central disc and five slender jointed arms arising from the lower surface to the disc.
3. The arms are covered on all sides by the plates or shields fringed with spines.
4. The ambulacral grooves, dermal branchiae and pedicellariae are entirely absent.
5. The oral surface bears a madreporite and a mouth possessing five movable plates serving as jaws.
6. The oral surface also bears five oral shields and podialpores.
7. The base of each arm bears a pair of deep grooves called bursal slits through which pass to the outside the mature sex cells.
8. The tube feet without suckers are present on the lower plates of arms.
9. *Ophiothrix* possesses a great power of regenerating its lost arm.

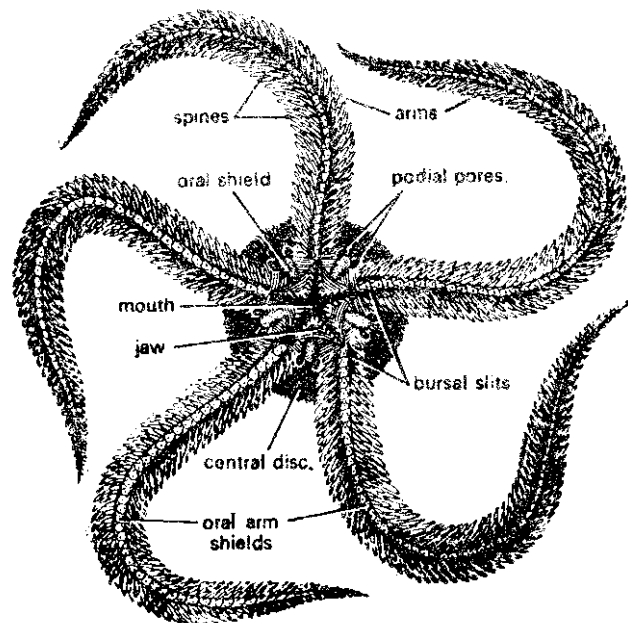
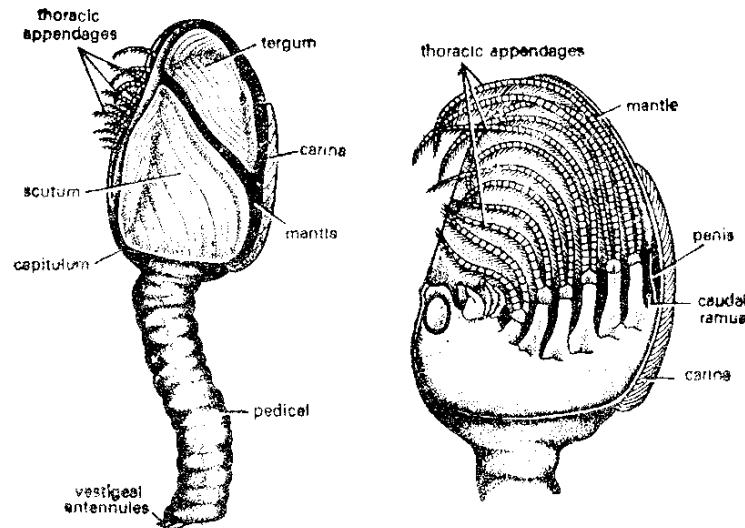


Fig. \_\_\_\_ *Ophiothrix* (Oral view)

***LEPAS*****Classification:**

Phylum	Arthropoda
Class	Crustacea
Order	Thoracica

Fig. \_\_ *Lepas*.

A—Entire animal; B—Carapace removed

**Characters:**

**Habit and habitat:** *Lepas* is sessile in habit and found all over the world attached to floating objects.

1. *Lepas* is commonly known as goose barnacle or ship barnacle.
2. Body consists of a long stalk or pedicel and capitulum (the body proper).
3. Pedicel is covered with a wrinkled skin and bears the body proper at its distal end.
4. Capitulum is enclosed in a bivalved carapace strengthened by five calcareous plates, proximal scuta, two distal terga and a single dorsal carina.
5. Mouth is provided with a pair of mandibles and two pairs of maxillae.
6. Antennae and paired eyes are absent.
7. Thorax bears six pairs of many jointed biramous appendages fringed with tufts for setae.
8. *Lepas* feeds upon minute organisms gathered by the thread-like feet and wafted into the mouth.

## *SACCOLINA*

### Classification:

Phylum	Arthropoda
Class	Crustacea
Order	Rhizocephala
Genus	<i>Sacculina</i>

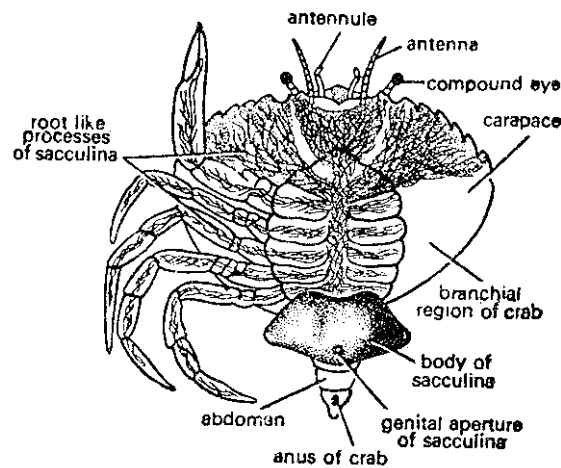


Fig. \_\_\_ *Sacculina* on crab's abdomen.

### Characters:

**Habit and habitat:** *Sacculina* is found as parasite on crabs.

1. *Sacculina* is commonly known as root headed barnacle.
2. It has the appearance of a fleshy tumor attached by a peduncle to the abdomen of the crab on its ventral side.
3. It shows extreme degeneration due to parasitic mode of life.
4. Segmentation, appendages, mouth and anus are entirely absent.
5. Peduncle ends numerous delicate root-like filaments which ramify within body of the host and absorb nourishment.
6. Opening of the mantle cavity is placed at the hind end of the parasite.
7. Hermaphrodite, *i.e.*, sexes are united.
8. Larva is cirripede-nauplius.
9. *Sacculina* causes many changes in the secondary sexual characters of the host, a phenomenon known as parasitic castration.

***ARENICOLA*****Classification:**

Phylum	Annelida
Class	Polychaeta
Order	Sedentaria
Genus	<i>Arenicola</i>

**Habit and habitat:** *Arenicola* is a marine worm, lives in U shaped burrows of sand. It is found in Mediterranean and European shores.

**Characters:**

1. *Arenicola* is commonly known as lug- or lobe-worm.
2. Body is stout, elongated, cylindrical worm-like measuring upto 20 cm in length and brownish or greenish in colour.
3. Body is divisible into three regions, anterior, middle and posterior.
4. Anterior region is thicker comprising of peristomium and first six setigerous segments.
5. Middle region comprises thirteen segments bearing setae and branched gills.
6. Posterior region is much thinner comprising of invariable number of segments devoid of parapodia, setae and gills.
7. Mouth lies ventral to the prostomium. The buccal region and pharynx protrude as proboscis.
8. The anus opens through the last segment.
9. Nephridia are six pairs.
10. *Arenicola* is generally used as a bait in fishing.

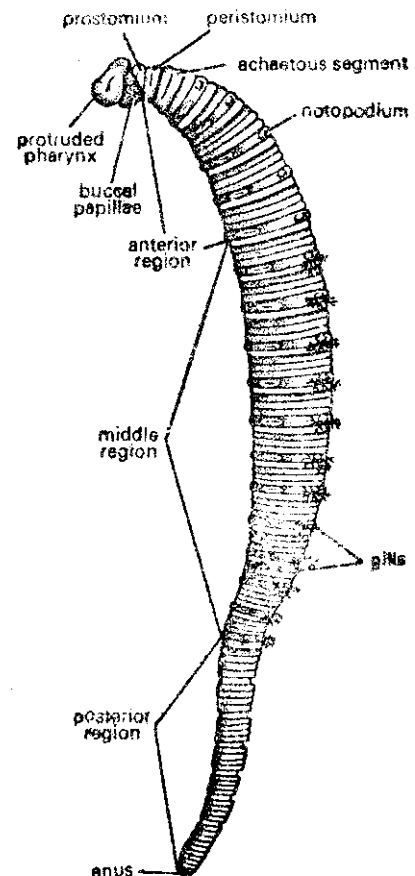


Fig. \_\_\_\_ *Arenicola*.

## ***REDIA LARVA OF FASCIOLA HEPATICA***

### **Characters:**

1. Redia larva develops from the germ cells of the sporocyst.
2. The body of redia is an elongated sac-like.
3. Anterior end bears the mouth leading into muscular pharynx, which finally leads into sac-like intestine.
4. Just behind the pharynx is a muscular ring-like swelling known as collar, which helps in locomotion.
5. Posterior region is also provided with two stumpy processes known as lappets helpful in locomotion.

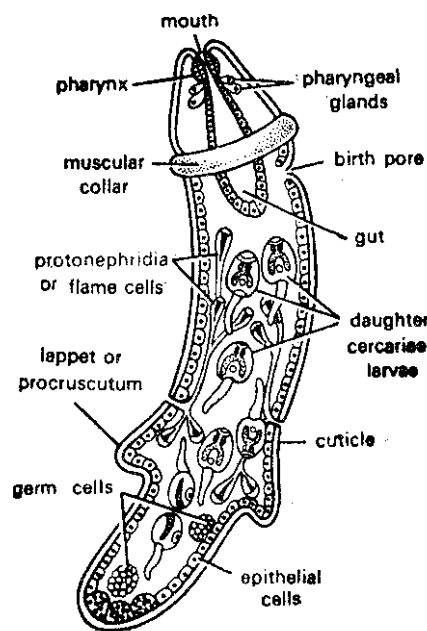


Fig. \_\_ Redia larva of *Fasciola hepatica*.

6. Just posterior to collar a permanent aperture, the birth pore is seen.
7. The space between the body wall and intestine contains few germ cells.
8. Germ cells often gives rise to second generation the daughter radiae.
9. Redia give rise to a new type of larva known as cercaria larva from the germ cells.
10. Cercaria larva comes out from redia through birth pore.



## *EUPLECTELLA*

### Classification:

Phylum	Porifera
Class	Hexactinellida
Order	Hexasterophora
Genus	<i>Euplectella</i>

### Characters:

**Habit and habitat:** *Euplectella* is a solitary animal. It is found abundantly in deep waters at the depth of 500 to 5,000 meters in slow running water.

1. *Euplectella* is popularly known as Venus's flower basket due to its beautiful elegant glossy shape.
2. It has a long curved, cylindrical body fastened in the mud of a sea bottom by a mass of long siliceous root spicules.
3. The size of individual varies from 15-30 cm. in length and 2-5 cm in diameter.
4. The skeleton consists of four and six-rayed siliceous spicules which are interlaced and fused at their tips forming a three dimensional network with parietal gaps.

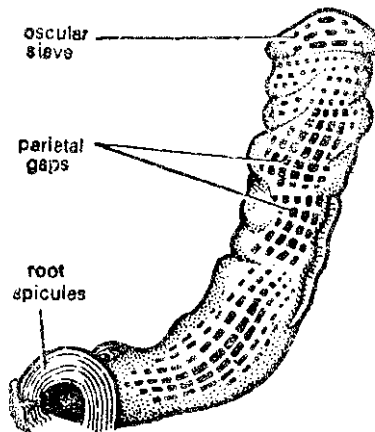


Fig. \_\_ *Euplectella*

5. The spicules are joined together forming a network.
6. The terminal opening is closed by an oscular sieve.
7. The parietal gaps in the network of spicules connect with the spongocoel.
8. Canal system simple having thimble-shaped radial canals.

## *MYSIS*

### Classification

Phylum	Arthropoda
Class	Crustacea
Order	Mysidacea
Genus	<i>Mysis</i>

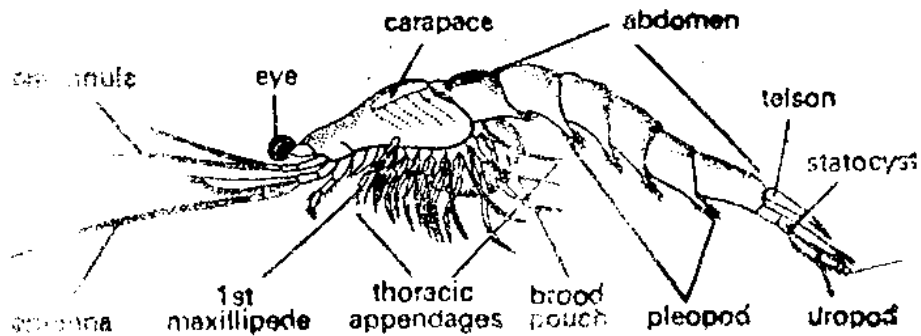


Fig. \_\_ *Mysis*.

### Characters

**Habit and habitat:** *Mysis* is a marine pelagic form. It is generally confined to the surface of water.

1. *Mysis* is a small transparent, shrimp-like form.
2. Body is bilaterally compressed and elongated measuring from 2-6 mm in length.
3. Carapace covers the entire thorax except the last two segments.
4. Head bears antennules, antennae and a pair of stalked eyes.
5. First pair of thoracic appendages are modified as maxillipedes and the rest are biramous serving as swimming organs.
6. Brood pouch is attached to the posterior thoracic segments.
7. Development takes place within the brood pouch, so there is no larval stage.

## PLASMODIUM (Malarial Parasite)

### Classification

Phylum	Protozoa
Class	Sporozoa
Order	Haemosporidia

### Characters

**Habit and habitat:** *Plasmodium* is found as parasite in the blood of vertebrates.

1. *Plasmodium* is an intracellular blood parasite of man and other vertebrates and causes malaria.
2. The life history of Plasmodium is completed in two hosts, viz., partly in definitive host, the man and partly in intermediate host, the female *Anopheles* mosquito.
3. When an infected female *Anopheles* mosquito bites a man, sporozoites are introduced in the blood from where they reach in liver cells through blood streams and multiply to form merozoites.
4. After few schizogoneous cycles in the liver, the merozoites enter the red blood corpuscles (R.B.C.) and feed on the contents of R.B.C.
5. After 2-8 schizogoneous changes in the main blood stream, the merozoites assume different shapes and known as gametocytes.
6. Gametocytes can not develop further in the blood of man, therefore, they wait for female *Anopheles* mosquito to suck them with the blood.
7. When gametocytes are sucked in by the female *Anopheles* with the blood of man, they undergo sporogony for further development.
8. There are four species of *Plasmodium* causing different types of fever:

- (i) *Plasmodium vivax* causes benign tertian fever.
- (ii) *P. falciparum* causes malignant tertian fever.
- (iii) *P. malariae* causes quartan fever.
- (iv) *P. ovale* causes ovale or mild tertian fever.

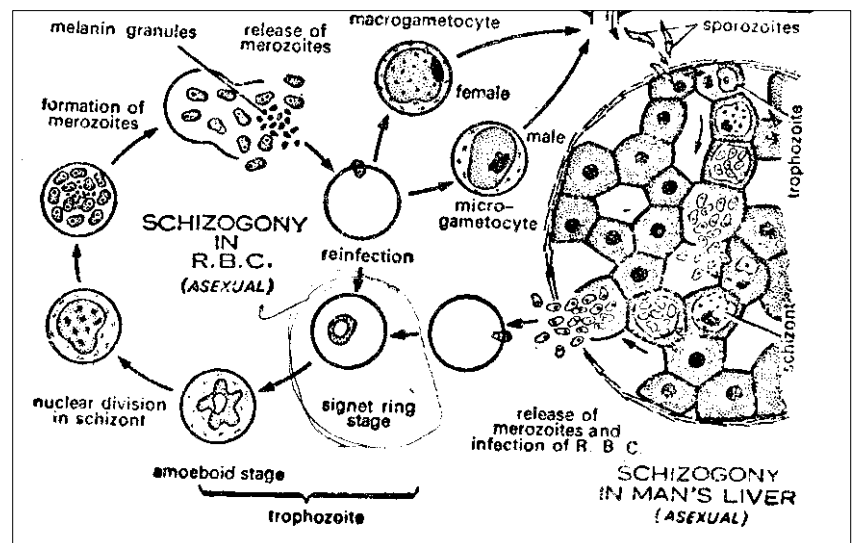


Fig. \_\_ Life cycle of *Plasmodium*

## SCOLOPENDRA

### Classification

Phylum	Arthropoda
Class	Myriapoda
Order	Chilopoda
Genus	Scolopendra (Centipede)

### Characters

**Habit and habitat:** *Scolopendra* commonly occurs under stones, in rotten logs and in houses in damp places.

1. *Scolopendra* is commonly called centipede.
2. Body is elongated and dorsoventrally flattened with numerous segments.
3. Head is distinct and bears a pair of antennae, a pair of mandibles and two pairs of maxillae.
4. Trunk segments numerous, each bearing a single pair of legs.
5. First pair of trunk appendages or maxillipedes bears a sharp claw connected with the poison gland.
6. Genital opening situated at the hind end of the body.
7. Sexes are separate.
8. Carnivorous, feeding on insects, spiders, worms slugs, etc.
9. *Scolopendra* is harmful to mankind.
10. Between the last leg bearing segment and the terminal telson are two small limblers segments – the pregenital and genital segments.

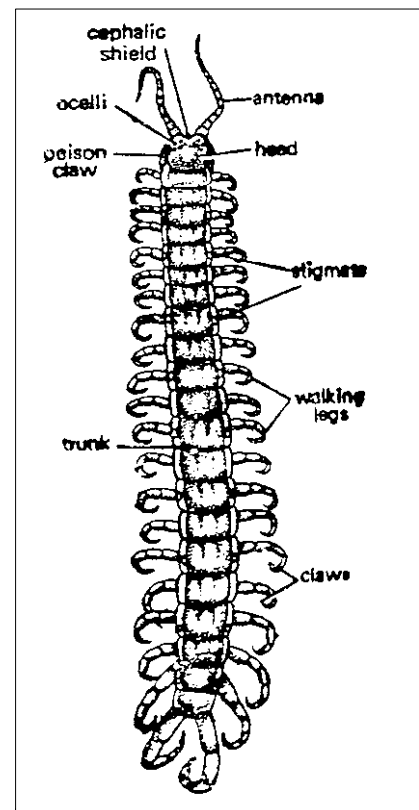


Fig. \_\_ *Scolopendra*

## *DENTALIUM*

### Classification

Phylum	Mollusca
Class	Scaphopoda
Genus	<i>Dentalium</i>

### Characters

**Habit and habitat:** *Dentalium* is marine and found in the sand at great depth.

1. *Dentalium* is commonly known as tusk shell.
2. Body is bilaterally symmetrical and enclosed in a tubular shell open at both ends.
3. Mantle folds are fused ventrally to form a tube enclosing the body.
4. Head is vestigial, bearing the mouth which is surrounded by a circlet of retractile tentacles, the captacula with sucker-like ends.
5. Foot is long and conical, protrudes through the anterior opening of the shell and is used in burrowing.
6. Well developed radula is present.
7. Anus lies behind the base of foot.
8. Gills are absent. Respiration by transverse folds in the lining of mantle.
9. A pair of nephridia is present with their external openings on either side of the anus.

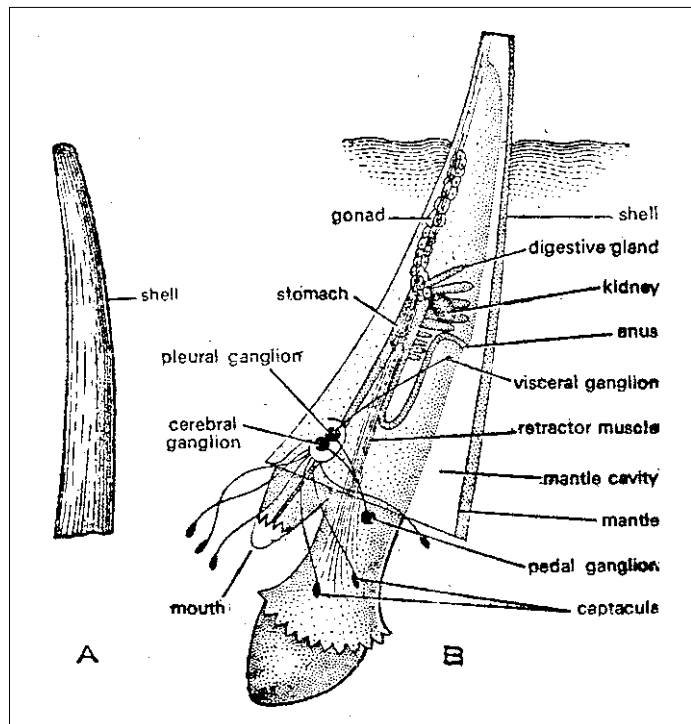


Fig. \_\_ *Dentalium*  
A-Shell; B-Structure of specimen buried in sand

10. Vascular system is poorly developed without distinct head.
11. Nervous system simple and consists of cerebral, pleural and pedal ganglia.
12. Eyes absent. Otocysts present.
13. Sexes are separate.
14. Development includes Veliger larva.
15. The shell exhibits brilliant jade green colour.